What is claimed is:

1. An amplifier system comprising:

a power amplifier operative to amplify an input signal to provide an amplified output signal; and

a mode selector that controls the operation of the power amplifier between a polar mode and a signal restoration mode based on a characteristic of the input signal relative to a threshold level.

2. The system of claim 1, further comprising a correction path that provides at least a substantial portion of the amplified output signal in the signal restoration mode.

3. The system of claim 2, the correction path mitigates signal distortion and out-of-band (OOB) emissions associated with the amplified output signal in the polar mode.

4. The system of claim 3, further comprising a feedback path from the power amplifier output to correction circuitry that mitigates errors associated with the correction path.

5. The system of claim 2, the power amplifier having an input terminal and a supply terminal, the mode selector transmits a phase modulated signal component of the input signal to the input terminal and an amplitude modulated signal component of the input signal to the supply terminal during polar mode operation, and the mode selector transmits one of a composite signal component, a phase modulated component, a constant amplitude signal and no signal to the input terminal and a substantially constant amplitude signal component to the supply terminal during signal restoration mode operation.

6. The system of claim 1, the input signal being a phase and/or amplitude modulated signal and the threshold level being an envelope amplitude level associated with the input signal, the power amplifier operates in the polar mode at input signal envelope amplitude levels above the threshold level and in a signal restoration mode at input signal envelope amplitude levels below the threshold level to mitigate distortion and power amplifier cut-off associated with zero crossings.

7. The system of claim 1, the mode selector having a first output coupled to an input terminal of the power amplifier through a first digital-to-analog converter (DAC), and a second output coupled to a supply terminal of the power amplifier through a second DAC and a modulation amplifier, the mode selector transmits digital representations of an amplifier input signal component and an amplifier supply signal component to the first and second DACs, respectively, which convert the digital representations into analog signals.

8. The system of claim 7, the mode selector having a third output coupled to a first summer through a third DAC, the first summer receives a portion of the power amplifier output through a coupler and provides an cancellation signal to a cancellation amplifier, the amplified cancellation signal is inverted and combined with a delayed version of the amplified output signal through a second summer, the third output being a digital representation of a reference signal corresponding to a desired amplified output signal.

9. The system of claim 8, at least one of the first and second DACs being delta-sigma DACs, such that the digital representations of at least one of the amplifier input signal component and the supply signal component are converted into the analog domain directly at a desired radio transmission frequency.

10. The system of claim 8, the cancellation amplifier being a linear amplifier.

11. The system of claim 7, the modulation amplifier being one of a Class-S type and a Class-G type modulator.

12. The system of claim 1, the power amplifier being a non-linear class type amplifier.

13. The system of claim 1, the mode selector generates a reference signal corresponding to a desired output signal of the amplifier system, the reference signal being combined with a portion of the output signal from the power amplifier to determine an cancellation signal, the cancellation signal being amplified, inverted and combined with a delayed version of the amplified output signal of the power amplifier to generate a final output signal.

14. The system of claim 13, the amplified inverted cancellation signal provides at least a substantial portion of the amplified output signal in signal restoration mode, and the amplified inverted cancellation signal mitigates signal distortion and out-of-band (OOB) emissions associated with the amplified output signal in the polar mode.

15. A transmitter comprising the amplifier system of claim 1.

16. A base station comprising the transmitter of claim 15.

17. An amplifier system comprising:

a power amplifier operative to amplify an input signal to provide an amplified output signal;

an input path coupled to an input of the power amplifier;

a supply path coupled to a supply of the power amplifier;

a mode selector that controls the operation of the amplifier system between a polar mode and a signal restoration mode based on an envelope amplitude level of the input signal relative to a threshold level; and

a correction path that mitigates signal distortion and out-of-band (OOB) emissions associated with the amplified output signal in the polar mode and provides at least a substantial portion of the amplified output signal in the signal restoration mode.

18. The system of claim 17, the power amplifier having an input terminal and a supply terminal, the mode selector transmits a phase modulated signal component of the input signal to the input terminal and an amplitude modulated signal component of the input signal to the supply terminal during polar mode operation, and the mode selector transmits one of a composite signal component, a phase modulated component, a constant amplitude signal and no signal to the input terminal and a substantially constant amplitude signal to the supply terminal during signal restoration mode operation.

19. The system of claim 18, the threshold level being selected to avoid excessive distortion and/or cut-off of the power amplifier due to low amplitude and/or zero-crossing portions of the input signal.

20. The system of claim 18, the input path comprising a first digital-to-analog converter (DAC) coupled to an input of the power amplifier and the supply path comprising a second DAC coupled to a modulation amplifier that is coupled to a supply of the power amplifier, the mode selector transmits digital representations of an amplifier input signal component and an amplifier supply signal component to the first and second DACs, respectively, which convert the digital representations into analog signals.

21. The system of claim 18, the correction path comprising:

a digital-to-analog converter (DAC) having an input coupled to the mode selector;

a first summer having a first input coupled to an output of the DAC and a second input coupled to an output of the power amplifier through a coupler;

a cancellation amplifier having an input coupled to an output of the first summer and an output coupled to a second summer, wherein the DAC receives a digital

representation of a reference signal corresponding to a desired amplified output signal that is converted into an analog reference signal and combined with a portion of the power amplifier output through the first summer to provide an cancellation signal that is amplified by the cancellation amplifier, the amplified cancellation signal is inverted and combined with a delayed version of the amplified output signal through the second summer.

22. The system of claim 21, further comprising a first phase inverter coupled between the mode selector and the DAC and a second phase inverter coupled between the cancellation amplifier and the second summer.

23. The system of claim 18, further comprising a feedback path from the power amplifier output to correction circuitry that mitigates errors associated with the correction path.

24. An amplifier system comprising:

means for amplifying an input signal to provide an amplified output signal;

means for switching operation of the amplifier system between a polar mode and a restoration mode based on a characteristic of the input signal relative to a threshold level; and

means for correcting the amplified output signal, the means for correcting distortion and mitigating out-of-band (OOB) emissions in the polar mode and providing at least a substantial portion of the amplified output signal in the signal restoration mode.

25. The system of claim 24, the means for switching operation of the amplifier system between a polar mode and a restoration mode comprising transmitting polar components of the input signal to the means for amplifying in the polar mode and transmitting one of a composite signal component, a phase modulated component, a constant amplitude signal and no signal to an input of the means for amplifying and a

substantially constant amplitude signal to a supply of the means for amplifying during signal restoration mode operation.

26. The system of claim 21, the input signal being a phase and/or amplitude modulated signal and the threshold level being an envelope amplitude level associated with the input signal, the means for amplifying operating in the polar mode at input signal envelope amplitude levels above the threshold level and in a signal restoration mode at input signal envelope amplitude levels below the threshold level to mitigate distortion and cut-off due to zero crossings associated with the input signal.

27. A method of amplifying an input signal with a power amplifier, the method comprising:

switching a power amplifier between a polar mode operation and a signal restoration mode operation based on a characteristic of an input signal relative to a threshold level;

transmitting a phase modulated component of the input signal to an input terminal of a power amplifier and an amplitude modulated component of the input signal to a supply terminal of the power amplifier during polar mode operation;

transmitting one of a composite signal component, a phase modulated component, a substantially constant amplitude signal and no signal to the input terminal of the power amplifier and a substantially constant amplitude signal to the supply terminal during the signal restoration mode operation;

amplifying the input signal *via* the power amplifier while continuously switching modes between polar mode operation and signal mode operation to provide an amplified output signal; and

performing a signal correction on the amplified output signal.

28. The method of claim 27, the threshold level being an envelope amplitude level associated with the input signal, the power amplifier operates in the polar mode at input signal envelope amplitude levels above the threshold level and in the signal restoration mode at input signal envelope amplitude levels below the threshold level to

mitigate distortion and power amplifier cut-off due to low amplitude signals levels and zero crossings associated with the input signal.

29. The method of claim 27, the signal correction comprising generating a separate reference signal corresponding to a desired output signal, the reference signal being combined with a portion of the output signal from the power amplifier to determine an cancellation signal, the cancellation signal being amplified, inverted and combined with a delayed version of the amplified output signal to generate a final output signal.

30. The method of claim 27, the signal correction mitigating distortion and out-of-band (OOB) emissions in the polar mode and providing at least a substantial portion of the amplified output signal in the signal restoration mode.